Power Ultrasound and Microwaves in metal-assisted synthesis

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Abstracts' Book

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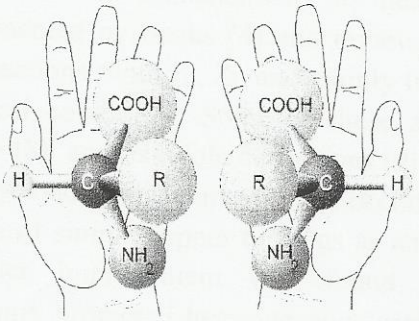

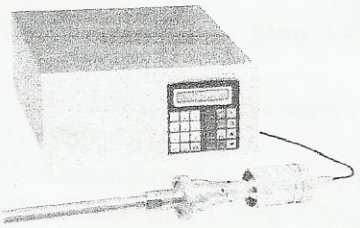

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The search for greener and more efficient regio- and stereoselective synthetic procedures to provide highly functionalized chemical structures has found, in metal-assisted reactions, a noteworthy contribution. All these reactions fall in the main domain of sonochemistry [1], no other technique can activate the metal and accelerate the process as much as power ultrasound. Although a piece of metal placed inside a microwave oven will lead to dangerous arcing, it is possible to perform organic reactions using well-dispersed fine metal particles in a polar high boiling solvent [2]. After the pioneering studies of Renaud in 1950 on metal-assisted sonochemical reactions [3], the biggest contribution came in the 80's from the group of J.L. Luche, who studied a variety of sonochemical organometallic reactions involving Ni, Li, Zn and Cu. In that decade, studies on the applications of sonochemistry in metal-assisted synthesis showed spectacular development as documented by books [4] and reviews [5]. Since the late nineties we have resorted to Barbier-like reactions (with Li, Zn and mainly In) in the synthesis of natural products, often under sonochemical conditions. Some of these are the synthesis of naturally occurring coumarins [6, 7], indole [8] and oxindole derivatives [9] and indolylbutenes [10]. The copper-catalyzed azide-alkyne cycloaddition (CuAAC) has become the paradigm for click chemistry. Sonication permits the use of simple copper turnings as an efficient and green catalyst in click reactions [11]. Further improvement was found with simultaneous ultrasound/microwave irradiation that strongly promoted heterogeneous catalyzed CuAAC [12, 13] allowing easy access to hybrid adducts that combined the properties of ionic liquids and cyclodextrins [14].

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